

**BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA
COLUMBIA, SOUTH CAROLINA**

HEARING #16-11554 OCTOBER 13, 2016 10:30 A.M.

DOCKET NO. 2016-223-E:

SOUTH CAROLINA ELECTRIC & GAS COMPANY – Petition of South Carolina Electric & Gas Company for Updates and Revisions to Schedules Related to the Construction of a Nuclear Base Load Generation Facility at Jenkinsville, South Carolina

**TRANSCRIPT OF TESTIMONY
AND PROCEEDINGS**

VOLUME 4 OF 4

HEARING BEFORE: Swain E. WHITFIELD, CHAIRMAN; Comer H. ‘Randy’ RANDALL, VICE CHAIRMAN; and COMMISSIONERS John E. ‘Butch’ HOWARD, Elliott F. ELAM, Jr., Elizabeth B. ‘Lib’ FLEMING, Nikiya M. ‘Nikki’ HALL, and G. O’Neal HAMILTON

ADVISOR TO COMMISSION: F. David Butler, Esq.
Senior Counsel

STAFF: Joseph Melchers, General Counsel; James Spearman, Ph.D., Executive Assistant to Commissioners; Philip Riley, Doug Pratt, Lynn Ballentine, and Tom Ellison, Advisory Staff; Jo Elizabeth M. Wheat, CVR-CM/M-GNSC, Court Reporter; and Deborah Easterling and Calvin Woods, Hearing Room Assistants

APPEARANCES :

*K. CHAD BURGESS, ESQUIRE, MATTHEW W.
GISENDANNER, ESQUIRE, MITCHELL WILLOUGHBY,
ESQUIRE, and BELTON T. ZEIGLER, ESQUIRE,
representing SOUTH CAROLINA ELECTRIC & GAS COMPANY,
PETITIONER*

PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

101 EXECUTIVE CENTER DRIVE
COLUMBIA, SC 29210

Post Office Box 11649
COLUMBIA, SC 29211

WWW.PSC.SC.GOV

APPEARANCES (Cont'g) :

SCOTT ELLIOTT, ESQUIRE, representing SOUTH CAROLINA ENERGY USERS COMMITTEE, INTERVENOR

ROBERT GUILD, ESQUIRE, representing SIERRA CLUB, INTERVENOR

FRANK R. ELLERBE, III, ESQUIRE, and ***JOHN H. TIENCKEN, JR., ESQUIRE,*** representing CENTRAL ELECTRIC POWER COOPERATIVE and THE ELECTRIC COOPERATIVES OF SOUTH CAROLINA, INTERVENORS

J. BLANDING HOLMAN, IV, ESQUIRE, and ***GUDRUN THOMPSON, ESQUIRE,*** representing SOUTH CAROLINA COASTAL CONSERVATION LEAGUE, INTERVENOR

SANDRA WRIGHT, appearing *pro se*, INTERVENOR

JEFFREY M. NELSON, ESQUIRE, and ***SHANNON BOWYER HUDSON, ESQUIRE,*** representing the SOUTH CAROLINA OFFICE OF REGULATORY STAFF

P R O C E E D I N G S

CHAIRMAN WHITFIELD: Please be seated. I'll call this hearing back to order. And, Mr. Burgess, you and your team, you want to present your next panel?

MR. WILLOUGHBY: Mr. Chairman, members of the Commission, we call next to the stand Dr. Joe Lynch and Mr. Kevin Kochems.

Gentlemen, come forward, and if you would remain standing until the court reporter administers the oath.

[Witnesses affirmed]

THEREUPON came,

J O S E P H M . L Y N C H , P h . D . ,

K E V I N R . K O C H E M S ,

called as witnesses on behalf of the Petitioner, South Carolina Electric & Gas Company, who, having been first duly affirmed, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. WILLOUGHBY:

Q Good morning, Dr. Lynch. Would you please identify yourself for the record.

A [LYNCH] I'm Joseph Lynch. I'm Manager of Resource Planning for the South Carolina Electric & Gas Company.

Q In connection with this proceeding, Dr. Lynch, have you

1 caused to be prepared and prefiled direct testimony
2 consisting of 17 pages?

3 **A** [LYNCH] Yes, I have.

4 **Q** If I asked you the questions that appear in the direct
5 testimony, would your answers be the same?

6 **A** [LYNCH] They would.

7 **MR. WILLOUGHBY:** Mr. Chairman, I would move
8 the introduction of the prefiled direct testimony
9 of Dr. Lynch, as if given orally from the stand.

10 **CHAIRMAN WHITFIELD:** Dr. Joe Lynch's prefiled
11 testimony will be entered into the record as if
12 given orally from the stand.

13 [See pgs 768-784]]

14 **BY MR. WILLOUGHBY:**

15 **Q** Dr. Lynch, attached to your prefiled direct testimony,
16 there were three exhibits, I believe: Exhibits JML-1,
17 JML-2, and JML-3. Is that correct?

18 **A** [LYNCH] Yes, sir.

19 **Q** Are there any corrections or changes to be made to those
20 exhibits?

21 **A** [LYNCH] No.

22 **MR. WILLOUGHBY:** Mr. Chairman, we would move
23 into the record as the next hearing exhibit the
24 three exhibits attached to the prefiled direct
25 testimony of Dr. Lynch.

1 **CHAIRMAN WHITFIELD:** Dr. Lynch's Exhibits
2 JML-1 through -3 will be entered into the record as
3 Hearing Exhibit No. 12.

4 [WHEREUPON, Exhibit No. 12 was marked and
5 received in evidence.]

6 **MR. WILLOUGHBY:** Thank you.

7 **BY MR. WILLOUGHBY:**

8 **Q** Dr. Lynch, have you prepared a summary of your direct
9 testimony?

10 **A** [LYNCH] I have.

11 **Q** Please deliver the summary at this time.

12 **A** [LYNCH] Good morning, Chairman Whitfield and members of
13 the Commission.

14 The purpose of my testimony is to present the
15 results of two studies. The first study is a
16 sensitivity study that compares the costs to complete
17 construction of the units under several labor cost
18 scenarios relative to the cost of the fixed-price
19 option. In the study, SCE&G analyzed labor cost per
20 hour, as of December 2015, calculated as an average in
21 the categories of all direct craft workers, all indirect
22 craft workers, and all field non-manual workers. SCE&G
23 analyzed the effect of labor growth rates on the project
24 of 0 percent, 2.9, 5.0, and 7.0 percent. Although the
25 0 and 7 percent scenarios are possible, SCE&G believes

1 they're unlikely, and that the most likely scenario for
2 future labor rates lies between the 2.9 and 5 percent
3 growth scenarios.

4 To reflect variations in the number of hours
5 required to complete construction of the units, SCE&G
6 also evaluated six productivity factor, or PF,
7 scenarios. This evaluation analyzed the effect of
8 various levels of efficiency with which direct craft
9 laborers are working to complete tasks, while keeping
10 constant the ratios of indirect and field non-manual
11 labor costs. The cumulative PF for this project in
12 December 2015 is approximately 1.75. With the
13 reorganization of the consortium and Fluor coming
14 on board, there is an ongoing effort to improve the PF
15 of the project. Nevertheless, SCE&G believes the most
16 likely PF range in the future will be between 1.5 and
17 2.0.

18 When focusing on the most likely range of 2.9
19 percent to 5 percent in labor rate growth rates and the
20 PF falling between 1.5 and 2, SCE&G estimates that the
21 cost to complete the units will be between 10.9 percent
22 and 29.3 percent higher than the fixed-price option.

23 While Westinghouse may be able to make significant
24 improvements over past performance, SCE&G believes it is
25 in the best interest of its customers to choose the

1 fixed-price option and remove the price uncertainty that
2 exists without it.

3 The second study is an economic study comparing the
4 impact on revenue requirements of continuing
5 construction of the units, as opposed to terminating the
6 project and building natural gas combined-cycle units
7 instead. The study uses the same methodology and
8 structure as a similar study presented to the Commission
9 in the 2015 update proceedings. The two alternatives
10 were analyzed under scenarios reflecting different
11 assumptions concerning natural gas prices, CO₂ emission
12 costs, and future load growth on the system.

13 The three natural gas price scenarios were the
14 company's base-case forecast for future natural gas
15 prices, a 50 percent higher gas price, and a 100 percent
16 higher gas price forecast. Of these, the 50 percent
17 higher forecast most closely reflects the forecast of
18 the Energy Information Administration.

19 The three variations of CO₂ emissions cost were \$0,
20 \$15, and \$30 per ton, starting in 2025 and escalating at
21 5 percent per year. The three load levels considered
22 were a base-case forecast and then a high and low
23 forecast. The company's base-case load forecast is set
24 forth in its Integrated Resource Plan, which includes
25 achieving 100 percent of SCE&G's goals for the

1 distributed energy and energy efficiency programs. The
2 high and low forecasts represented adjustment to the
3 base-case forecast of plus or minus 5 percent. The
4 load-growth scenarios show that varying load up or down
5 5 percent does not significantly affect the value of the
6 scenarios. This is relevant because including more
7 distributed energy resources – for example, solar
8 generation – or more energy efficiency gains has the
9 same effect as reducing load growth.

10 In all 27 scenarios, the effect of canceling the
11 units and switching to natural gas generation increases
12 the costs to our customers by a significant amount. The
13 most reasonable scenario is gas prices at a base cost
14 plus 50 percent and CO₂ emissions at \$15 per ton. In
15 that scenario, canceling the units and switching to
16 natural gas would increase the costs to SCE&G customers
17 for electric service by about \$374 million per year, on
18 average, over the 40-year planning horizon.

19 We also modeled how much the construction costs of
20 the units would have to increase in order to achieve a
21 breakeven point between completing the nuclear project
22 and canceling it. In the most likely scenario, the
23 future capital costs of the units would have to increase
24 from \$7.67 billion to about \$11.5 billion to reach the
25 breakeven point between the alternatives.

1 This concludes my summary.

2 **MR. WILLOUGHBY:** Thank you, Dr. Lynch.

3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23 [PURSUANT TO PREVIOUS INSTRUCTION, THE
24 PREFILED DIRECT TESTIMONY OF JOSEPH M.
25 LYNCH, Ph.D., FOLLOWS AT PGS 768-784]

DIRECT TESTIMONY
OF
JOSEPH M. LYNCH
ON BEHALF OF
SOUTH CAROLINA ELECTRIC & GAS COMPANY
DOCKET NO. 2016-223-E

1 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND CURRENT**
2 **POSITION WITH SOUTH CAROLINA ELECTRIC & GAS COMPANY**
3 **(“SCE&G” OR THE “COMPANY”).**

4 A. My name is Joseph M. Lynch and my business address is 220 Operation
5 Way, Cayce, South Carolina. My current position with the Company is Manager
6 of Resource Planning.

7 **Q. DESCRIBE YOUR EDUCATIONAL BACKGROUND AND**
8 **PROFESSIONAL EXPERIENCE.**

9 A. I graduated from St. Francis College in Brooklyn, New York, with a
10 Bachelor of Science degree in mathematics. From the University of South
11 Carolina, I received a Master of Arts degree in mathematics, a Master of Business
12 Administration degree, and a Ph.D. in management science and finance. I was
13 employed by SCE&G as a Senior Budget Analyst in 1977 to develop econometric
14 models to forecast electric sales and revenue. In 1980, I was promoted to
15 Supervisor of the Load Research Department. In 1985, I became Supervisor of

1 Regulatory Research where I was responsible for load research and electric rate
2 design. In 1989, I became Supervisor of Forecasting and Regulatory Research,
3 and, in 1991, I was promoted to my current position of Manager of Resource
4 Planning.

5 **Q. WHAT ARE YOUR CURRENT DUTIES AS MANAGER OF RESOURCE**
6 **PLANNING?**

7 A. As Manager of Resource Planning, I am responsible for producing
8 SCE&G's forecast of energy, peak demand, and revenue; for developing the
9 Company's generation expansion plans; and for overseeing the Company's load
10 research program.

11 **Q. HAVE YOU TESTIFIED BEFORE THE PUBLIC SERVICE**
12 **COMMISSION OF SOUTH CAROLINA ("COMMISSION")**
13 **PREVIOUSLY?**

14 A. Yes. I have previously testified on a number of occasions before this
15 Commission.

16 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

17 A. The purpose of my testimony is to present the results of two studies of the
18 cost to construct the V.C. Summer Units 2 and 3 (the "Units") under the
19 Engineering, Procurement, and Construction Agreement ("EPC Contract") as
20 amended by the October 27, 2015 Amendment ("Amendment"). The first study,
21 attached as Exhibit No. __ (JML-1), is a sensitivity study that analyzes the impact
22 of SCE&G's option to transfer the majority of the remaining EPC Contract cost to

the Fixed Price category (the “Fixed Price” option) as provided by the Amendment. This study compares the cost-to-complete construction of the Units under several labor cost scenarios relative to the cost of the Fixed Price option. The second study, attached as Exhibit No. __ (JML-2), is an economic study comparing the impact on revenue requirements of continuing construction of the Units as opposed to terminating the project and building natural gas combined-cycle units instead.

THE SENSITIVITY STUDY

Q. WHAT IS THE STRUCTURE OF THE SENSITIVITY STUDY?

A. The sensitivity study analyzes the impact of labor costs on the cost-to-complete the Units. There are two primary components to labor costs: 1) the labor cost per hour, and 2) the number of hours worked (specifically in this case, the number of hours to complete construction of the Units).

Q. WHAT WAS THE LABOR COST PER HOUR USED IN THE SENSITIVITY STUDY?

A. The sensitivity study uses the labor cost per hour as of December 2015 calculated as an average in the categories of all direct craft workers, all indirect craft workers, and all field non-manual workers. SCE&G projected these three labor rates to increase by 2.9% per year over the remainder of the construction period. This scenario is the “base case” or “2.9%” scenario. The 2.9% growth rate was chosen because that is the 5-year compound growth rate of the Handy-Whitman cost index in the “All Steam & Nuclear” category for the South Atlantic.

Also, by coincidence, it is the 5-year growth rate in construction labor costs projected by our economic forecasting firm, IHS Global Insight, Inc. (“IHS”), over the period 2016-2020 averaged over several categories of labor, again, for the South Atlantic region of the country.

Q. HOW MANY DIFFERENT SCENARIOS DID SCE&G ANALYZE IN THE SENSITIVITY STUDY?

A. Exhibit No. __ (JML-1) reflects the results of my sensitivity study and shows that four different labor growth rates for the completion of construction of the Units from the current time to the Guaranteed Substantial Completion Dates (“GSCDs”) under the Amendment were analyzed. The four scenarios are:

- The “no growth” or “0%” scenario represents a labor growth rate of 0%.
- The “base case” or “2.9%” scenario represents a labor growth rate of 2.9%.
- The “medium growth” or “5.0%” scenario represents a labor growth rate of 5.0%.
- The “high growth” or “7.0%” scenario represents a labor growth rate of 7.0%.

Q. WHICH LABOR RATE SCENARIO DOES SCE&G BELIEVE IS THE MOST LIKELY TO OCCUR?

A. While there is much uncertainty in projecting future labor rates, SCE&G believes the no growth scenario representing no growth in labor rates to be unrealistically optimistic. On the other extreme, the high growth scenario represents a strong growth in labor rates that is possible but similarly unlikely.

The base case scenario, corresponding to a 2.9% growth in labor rates, represents a small premium over inflation which would be reasonable under most situations. However, considering the skilled labor force required for this project and the need for night time work hours, a faster growth rate is likely. Consequently, SCE&G believes the most likely scenario for future labor rates is between the base case (2.9%) and medium growth (5.0%) scenarios.

Q. HOW DID THE SENSITIVITY STUDY REFLECT VARIATIONS IN THE NUMBER OF HOURS REQUIRED TO COMPLETE CONSTRUCTION OF THE UNITS?

A. The productivity factor ("PF") was the evaluation measure used in the sensitivity study to reflect variations in the number of hours required to complete construction of the Units. SCE&G defined the PF as the ratio of the number of actual direct craft hours worked to complete a project compared to the number of hours budgeted for that work. Six PF scenarios were studied: 1.00, 1.15, 1.25, 1.50, 1.75, and 2.00.

Q. WHAT IS THE SIGNIFICANCE OF THE PF?

A. The PF represents the efficiency with which direct craft laborers are working to complete tasks. A PF of 1.00 means that the actual number of hours required for a task was the exact number of hours budgeted for that task. For example, if a certain welding job was budgeted to take 4.0 hours, then a PF of 1.25 would mean that the welding job actually took 5.0 hours to complete (4.0 hours \times 1.25 PF = 5.0 hours).

Q. SINCE THE PF APPLIES TO DIRECT CRAFT LABOR HOURS ONLY, HOW DOES THE SENSITIVITY STUDY ACCOUNT FOR INDIRECT CRAFT LABOR COSTS AND FIELD NON-MANUAL LABOR COSTS?

A. Indirect craft labor supports direct craft labor by providing such things as worker training, safety, warehouse staffing, and facilities maintenance. In order for construction to be completed by the GSCDs, SCE&G estimates that approximately 0.66 hours of indirect craft labor is required to support each hour of direct craft labor. While the actual indirect-to-direct ratio may vary from 0.66, SCE&G does not believe any variations would be significant and has kept this ratio constant for the sensitivity study. Field non-manual labor represents the cost of field engineers, quality assurance and control, administrative support, and related non-manual labor. In order for construction to be completed by the GSCDs, SCE&G estimates that approximately 0.74 hours of field non-manual labor is required to support each hour of direct craft labor. Thus, as was done with indirect craft labor, the ratio of field non-manual labor-to-direct craft labor is fixed at 0.74 for the study. Consequently, in the sensitivity study as direct craft labor hours vary so does the number of indirect labor hours and field non-manual hours as well as the associated cost for those categories of labor.

1 **Q. ARE YOU BEING CONSERVATIVE BY SETTING THE RATIO OF**
2 **INDIRECT LABOR HOURS TO DIRECT LABOR HOURS AT 0.66 AND**
3 **THE RATIO FOR FIELD NON-MANUAL LABOR AT 0.74?**

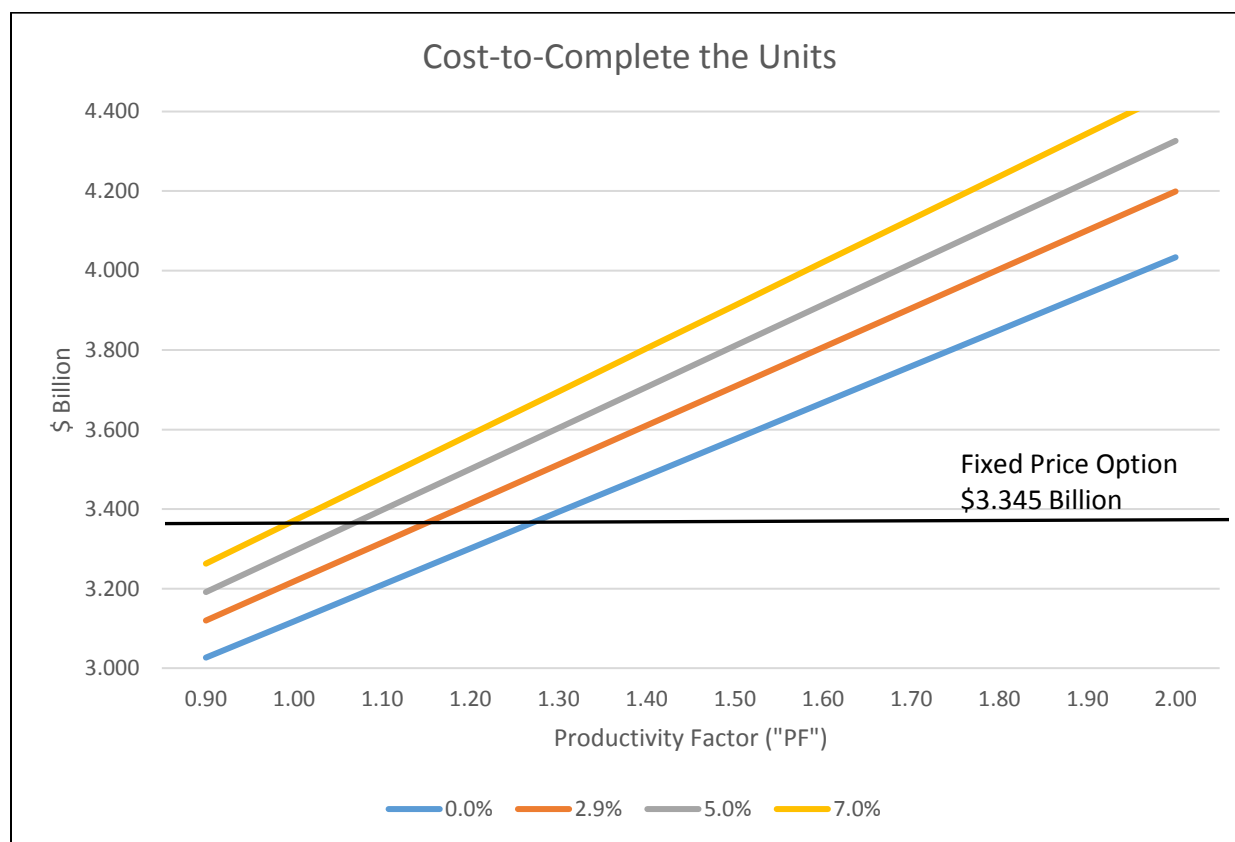
4 A. Yes. These are very conservative assumptions in the sense that they are
5 low compared to historical experience with the project. If these ratios were
6 higher, the sensitivity study would reflect that the Fixed Price option would be
7 even more attractive. The historical average ratio of indirect-to-direct hours is
8 1.21 and of field non-manual-to-direct hours is 1.22. The sensitivity study
9 assumes that Westinghouse Electric Company, LLC (“Westinghouse”) and Fluor
10 Corporation (“Fluor”) will be able to significantly reduce the need for non-direct
11 labor hours. If they are unable to do so, then the Fixed Price option becomes even
12 more valuable to SCE&G and its customers.

13 **Q. WHICH PF SCENARIO DOES SCE&G BELIEVE IS THE MOST LIKELY**
14 **TO OCCUR?**

15 A. The cumulative PF for this project through December 2015 is
16 approximately 1.75. With the reorganization of the Consortium and Fluor coming
17 onboard, there is ongoing effort to improve the PF of the project. However,
18 SCE&G believes the most likely PF range will be between 1.50 and 2.00.

Q. CAN THE COST-TO-COMPLETE THE UNITS UNDER THE DIFFERENT SCENARIOS BE SHOWN GRAPHICALLY?

A. Yes, it can. The following graph depicts the relationship between the cost-to-complete on the vertical axis and the PF value on the horizontal axis with a reference line being added to show the cost of the Fixed Price option.



Q. WHAT CAN BE CONCLUDED FROM THIS GRAPH?

A. By noting where the reference line for the cost of the Fixed Price option crosses each of the cost-to-complete lines, the breakeven value for the PF can be observed. For example, under the 2.9% labor cost rate scenario, the cost-to-complete is represented by the second line up from the bottom (the red line). The breakeven PF value under this scenario is 1.130. This means that if Westinghouse

can achieve a PF value less than 1.130 and maintain the labor rates in the base case scenario, then the Fixed Price option will increase cost to SCE&G's customers beyond the fixed price. On the other hand if the PF value is greater than 1.130, then the Fixed Price option lowers costs to SCE&G customers. The breakeven PF values for the 0%, 2.9%, 5.0%, and 7.0% scenarios are approximately 1.248, 1.130, 1.049, and 0.976 respectively.

Q. WHAT DO YOU CONCLUDE FROM THE SENSITIVITY STUDY?

A. Table A of the sensitivity study contains the results of the sensitivity study. For each combination of PF and labor cost growth rate, the table shows the cost-to-complete the Units as a percentage change to the Fixed Price option. When focusing on the most likely range of 2.9% to 5.0% in labor rate growth rates and the PF falling between 1.50 and 2.00, SCE&G estimates that the cost-to-complete the Units will be between 10.9% and 29.3% higher than the Fixed Price option. While Westinghouse may be able to make significant improvements over past performance, SCE&G believes it is in the best interest of its customers to choose the Fixed Price option and remove the price uncertainty that exists without it.

THE ECONOMIC STUDY

Q. PLEASE DESCRIBE THE METHODOLOGY USED IN THE ECONOMIC STUDY.

A. The economic study uses the same methodology and structure as the similar study presented to the Commission in 2015 in Docket No. 2015-103-E. The study is based on modeling techniques that are widely accepted in the utility industry to

determine the relative cost and value of alternative approaches to meeting customers' electricity needs. The models used in the study include information about system loads, load shapes (the number of hours each year that specific load levels are reached), the available units, the ramp rates of units (the speed at which units can be brought to various levels of production), the availability factors of the units (how often units are off-line or have mechanical or environmental limits on their generating capacity), the fuel costs of units (including environmental costs of burning fuel and disposing of ash or other fuel wastes), the fuel efficiency of units (how much fuel cost is incurred per megawatt (MW) of energy produced), and the capital and operating costs of any new units including depreciation, abandonment costs, salvage cost, production tax credits and other capital related costs or benefits. Each scenario includes a different set of assumptions about one or more variables. In this case, the models dispatched the system year-by-year for 40 years to determine the relative cost to customers under each scenario considered.

Q. WHAT SCENARIOS WERE MODELED?

A. The two alternatives—completing construction of the Units compared to terminating construction of the Units and replacing them with combined-cycle gas plants—were analyzed under 27 scenarios reflecting different assumptions concerning natural gas prices, carbon dioxide (“CO₂”), emissions costs, and future load growth on our system.

Q. WHAT NATURAL GAS PRICE SCENARIOS WERE MODELED?

A. The three natural gas price scenarios modeled were the Company's base case forecast of future natural gas prices, a 50% higher gas price and a 100% higher gas price forecast.

Q. WHY WERE THESE THREE NATURAL GAS PRICE SCENARIOS CHOSEN?

A. The base case is a forecast that the Company compiles using reported New York Mercantile Exchange ("NYMEX") gas contracts. Future prices for contracts for three years are used. Beginning in year four, the forecast escalates the NYMEX price using escalation rate forecasts provided by IHS.

SCE&G uses the base case forecast as a starting point in modeling because it is simple, objective, and less subject to bias from subjective considerations. But this is also a limitation. The base case gas price may ignore important factors that require subjective judgment and are not reflected in current NYMEX prices or in escalation forecasts. In short, fossil fuel prices, especially natural gas prices, are notoriously difficult to forecast with confidence. For this reason, SCE&G usually conducts sensitivity analyses particularly with respect to future natural gas prices. Therefore, in addition to the base case gas price forecast, two other price scenarios were developed: one with 50% higher prices than the base case and a second with 100% higher prices. Higher gas prices seem very reasonable when you consider ongoing and future changes that will put upward pressure on natural gas prices. The most obvious of these changes include: 1) significantly increased demand in

1 the power generation sector caused by the retirement of coal plants due to the
2 Environmental Protection Agency's ("EPA") Mercury and Air Toxics Standards,
3 or MATS, regulations and the Clean Power Plan, as well as the practical inability
4 to add coal capacity in the future; 2) the opening of the domestic gas market to
5 higher world prices through liquefied natural gas, or LNG, exportation; 3) the
6 increasing regulatory scrutiny of "fracking" from an environmental point of view
7 which will tend to increase the cost of production and reduce the supply of gas;
8 and 4) the fact that burning natural gas emits CO₂ into the atmosphere and that the
9 gas industry will likely come under environmental regulations similar to those
10 crippling the coal industry. The Energy Information Administration ("EIA") in
11 the early release of their 2016 Annual Energy Outlook provides another scenario
12 of forecasted natural gas prices and their forecast is shown in the study as a point
13 of comparison. The EIA forecast closely approximates SCE&G's 50% higher gas
14 price forecast.

15 **Q. WHAT CO₂ PRICE SCENARIOS WERE MODELED?**

16 A. The three variations of CO₂ emission costs were \$0, \$15, and \$30 per ton
17 starting in 2025 and escalating at 5% per year. While the EPA's Clean Power Plan
18 is currently subject to a judicial stay, for the purposes of this study, SCE&G
19 assumed that the EPA's Clean Power Plan goes into effect as written. Under the
20 scenario of completing the Units, SCE&G assumes that the State of South
21 Carolina chooses the "rate-based" compliance option in which each electric
22 generating unit would be required to meet an emission rate target. Under a rate-

1 based compliance plan the new nuclear units would count towards compliance and
2 would generate sufficient emission rate credits such that SCE&G would not be
3 required to incur any additional CO₂ compliance costs under the Clean Power
4 Plan. Therefore the cost of CO₂ emissions to SCE&G and its customers will be
5 zero.

6 If SCE&G does not complete the Units but instead builds natural gas
7 combined-cycle plants, then the Company assumes the State will choose the
8 “mass-based” compliance option where an electric generating unit would be
9 allocated a CO₂ emission cap. Under this option, SCE&G will be subject to a CO₂
10 emission limit and will incur costs to comply. It is uncertain what the cost of CO₂
11 emissions will be in the future which is the reason for studying several levels of
12 cost.

13 If SCE&G does not complete the Units but instead builds natural gas
14 combined-cycle plants, and if the State should select the rate-based compliance
15 option (which SCE&G believes to be unlikely in this scenario), then SCE&G and
16 its customers will be subject to CO₂ emission costs. These costs also will be
17 substantially greater than they would have been if the State had selected the mass-
18 based compliance option instead.

19 **Q. WHAT LOAD GROWTH SCENARIOS WERE MODELED?**

20 A. The three load levels considered were the Company’s base case load
21 forecast and then a low and high forecast which adjusted the forecasted load plus
22 and minus 5%.

Q. WHAT IS THE VALUE OF INCLUDING THESE DIFFERENT LOAD GROWTH SCENARIOS?

A. The load growth scenarios show that varying load up or down 5% does not significantly affect the value of the scenarios. This is relevant because including more distributed energy resources (solar generation) or more energy efficiency gains has the same effect as reducing load growth. Our base case forecast already includes the impact of currently mandated distributed energy resources and currently planned energy efficiency investments. There may be other important reasons to increase investment in these resources. But the study shows that increasing these resources by a substantial amount does not change the value of the Units to customers in a meaningful way.

Q. WHAT WERE THE RESULTS OF THE STUDY?

A. The study shows that in all 27 scenarios, including base gas price and \$0 carbon costs, the effect of cancelling the Units and switching to natural gas generation increases the costs to our customers by a significant amount. The most reasonable scenario is gas prices at base cost plus 50% and CO₂ emissions at \$15 per ton. In that scenario, cancelling the Units and switching to natural gas would increase the cost to SCE&G's customers for electric service by \$374 million per year on average over the 40-year planning horizon.

1 **Q. HAVE YOU ANALYZED THE SENSITIVITY OF RESULTS TO AN**
2 **INCREASE IN THE COST-TO-COMPLETE THE NUCLEAR UNITS?**

3 A. Yes. My analysis is reflected in Exhibit No. ____ (JML-3), which shows,
4 based on current circumstances, the amount nuclear construction costs would need
5 to increase in order to achieve a breakeven point between completing the nuclear
6 project and cancelling it. This study includes the updates to capital costs that are
7 before the Commission in this proceeding. Thus, the total cost of completing the
8 nuclear plants is assumed to be about \$7.67 billion (SCE&G's share of the total
9 cost). Exhibit No. ____ (JML-3) shows how much this cost would have to increase
10 to make the incremental revenue requirements of cancelling the nuclear project
11 equal to those of completing it. The most reasonable scenario reflects base gas
12 cost plus 50% and \$15 per ton CO₂. In that scenario, the future capital costs of the
13 Units would have to increase by about \$3.83 billion above current forecasts to
14 overcome the benefit of \$374 million per year from completing the Units at their
15 current cost. Stated differently, from where we are today, the total construction
16 cost would have to increase from \$7.67 billion to about \$11.50 billion to reach the
17 breakeven point between the alternatives.

CONCLUSION

Q. BASED UPON THE STUDIES AND ANALYSES YOU HAVE CONDUCTED IN CONNECTION WITH THIS PROCEEDING, WHAT IS YOUR EXPERT OPINION AS TO WHETHER SCE&G SHOULD SELECT THE FIXED PRICE OPTION?

A. It is my expert opinion that the Company should exercise the Fixed Price option. As reflected in Exhibit No. ____ (JML-1), labor costs will be the principal driver of changes in what Westinghouse could charge SCE&G to complete the project. Given the most likely range of potential variables for labor productivity and labor price rates, the cost to SCE&G and its customers to complete the Units if the Fixed Price option is not chosen will be substantially greater than the Fixed Price option. Rather, the Fixed Price option will save customers between 10.9% and 29.3% of the cost of the project. Accordingly, it is my opinion that the Fixed Price option is reasonable and prudent and that the Company should select this option as being in the best interest of SCE&G and its customers.

Q. WHAT IS YOUR EXPERT OPINION AS TO WHETHER THE COMPANY SHOULD TERMINATE CONSTRUCTION OF THE UNITS AND PURSUE A NATURAL GAS STRATEGY TO MEET FUTURE GENERATION NEEDS?

A. It is my expert opinion that abandoning construction of the Units at this time and pursuing a natural gas generation strategy for base load generation needs would be imprudent and would result in significantly increased costs to customers.

1 The study presented in Exhibit No. ____ (JML-2) demonstrates that the Company's
2 nuclear strategy remains the most prudent and lowest cost strategy designed to
3 meet our customers' needs for base load generation in the future. In fact, based
4 upon my analysis, completing construction of the Units will result in an estimated
5 cost savings of \$374 million per year for 40 years. For these reasons, in my
6 opinion, the Company's most prudent course is to continue constructing the Units
7 as previously authorized and approved by the Commission.

8 **Q. DOES THAT CONCLUDE YOUR TESTIMONY?**

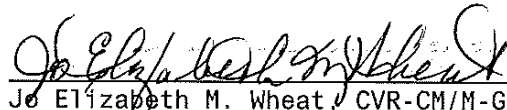
9 A. Yes, it does.

C E R T I F I C A T E

I, Jo Elizabeth M. Wheat, CVR-CM-GNSC, Notary Public in and for the State of South Carolina, do hereby certify that the foregoing is, to the best of my skill and ability, a true and correct transcript of proceedings had and testimony adduced in a hearing held in the above-captioned matter before the PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA;

That the witnesses appearing during said hearing were affirmed by me to state the truth, the whole truth, and nothing but the truth;

IN WITNESS WHEREOF, I have hereunto set my hand and seal, on this the 21st day of October, 2016.


Jo Elizabeth M. Wheat, CVR-CM/M-GNSC
Hearings Reporter, PSC/SC
My Commission Expires: January 27, 2021.